



## Mission update

### Schedule for 2000

See story, Page 3

#### STS-99

Shuttle Radar Topography Mission

Target launch date: Jan. 13, 2000 at 1:11 p.m. (EST)

Launch window: 2 hours, 30 minutes

Target landing date: Jan. 24, 2000

Mission duration: 11 days

Orbiter: Endeavour, OV-105

#### STS-101

ISS — Spacehab

Target launch date: No earlier than (NET) March 16, 2000

Launch window: 5-10 minutes

Target landing date:

March 27, 2000

Mission duration: 11 days

Orbiter: Atlantis, OV-104

#### STS-92

ISS — Z-1 Truss, PMA-3

Target launch date:

June 14, 2000 (NET)

Launch window: 10 minutes

Mission duration: 10 days

Orbiter: Discovery, OV-103

#### STS-97

ISS — PV module P6

Target launch date: July 20, 2000 (NET)

Orbiter: Endeavour, OV-105

#### STS-98

ISS — U.S. Laboratory

Target launch date:

Aug. 19, 2000 (NET)

Orbiter: Atlantis, OV-104

#### STS-102

ISS — Leonardo

Target launch date: Oct. 19, 2000 (NET)

Orbiter: Discovery, OV-103

#### STS-100

ISS — Raffaello

Target launch date: Nov. 30, 2000 (NET)

Orbiter: Endeavour, OV-105

# Spaceport News

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John F. Kennedy Space Center

## Flight puts focus on Hubble

The final human space flight of the 20th century will help ensure that the Hubble Space Telescope continues to direct its gaze deep into astronomical events from previous millennia.

Space Shuttle mission STS-103, the third servicing mission of the orbiting observatory, will provide upgrades and the replacement of worn parts on the nine-year-old Hubble. Servicing of the observatory originally was scheduled for June 2000, but the project was split into two separate missions after the third of Hubble's six gyroscopes failed. The next servicing of the telescope is now planned for 2001.

STS-103, scheduled to launch aboard Discovery on Dec. 9 at 1:10 a.m., carries a crew of seven astronauts led by commander Curtis L. Brown Jr. It will be Brown's sixth space flight and his third as a com-

(See Hubble, Page 2)



Carrying the Space Shuttle Discovery and the mobile launcher platform, the crawler transporter makes the turn toward Launch Pad 39B. The orbiter made its 4.2-mile (6.8 kilometer) trek from the Vehicle Assembly Building on Nov. 13. The mission is a "call-up" intended to replace and repair portions of the Hubble Space Telescope. The seven-member crew is scheduled to perform four spacewalks during the mission.

## KSC makes giant leap in tech awards

Bill Helms, chief of KSC's Instrumentation Development Laboratory, was giving a tour of the facility some time ago to a special visitor from NASA Headquarters.

During the visit, Dr. Paul Curto, senior technologist for the NASA Invention and Contributions Board at NASA Headquarters, asked Helms about projects he had worked on before becoming a manager. When Helms mentioned his role in the development of a hazard-

ous gas detection system for the Space Shuttle, Curto's ears perked up.

As the official who represents NASA workers in their bids for the Agency's most prestigious technology awards, Curto wondered whether Helms had ever sought recognition for the Space Shuttle Hazardous Gas Detection System (HGDS). "No," Helms replied.

"He and (KSC Awards Liaison Officer) Pam Bookman kept bugging me to the point I

finally sat down and wrote something up," Helms recalled.

The payoff surpassed any expectations Helms might have had. He recently learned that he had received a \$10,000 Space Act Award — part of \$15,500 given to the team that worked on the project (including David Craig of Boeing, Jerry Fuchs of the Department of Defense and the late Alphonse Schwindt). With the prize, Helms joins the NASA Hall of Fame of Excep-

(See Awards, Page 6)

Led by commander Curt Brown, right, the crew of STS-103 makes its walkout from the Operations and Checkout Building on Nov. 17 before taking part in a Terminal Countdown Demonstration Test at Launch Pad 39B.



## Hubble ...

*(Continued from Page 1)*

mander. Pilot Scott J. Kelly will make his first space flight, while the remaining five astronauts all have previous Shuttle experience.

With the recent failure of a fourth gyroscope on Hubble, the telescope was no longer able to gather data and was placed into a "safe," or non-operational mode.

The servicing of Hubble will occur during four planned spacewalks involving payload commander Steven L. Smith and mission specialists C. Michael Foale, John M. Grunsfeld and Claude Nicollier.

The launch of STS-103 will close the longest period without a Shuttle flight since the period following the Challenger accident in 1986. The previous mission, STS-93, landed on July 27. An electrical short during that mission led to thorough wiring inspections for all four orbiters.

With the wiring inspections completed, Discovery rolled out to Launch Pad 39B on Nov. 13.

The crew took part in the Terminal Countdown Demonstration Test on Nov. 16 and 17. During a question-and-answer session with reporters, Brown and his crew expressed their eagerness to complete the mission.

In addition to replacing all six gyroscopes, the crew will replace a guidance sensor and the spacecraft's computer. The new computer will reduce the burden of flight software maintenance and significantly lower costs. In addition, a voltage/temperature kit will be installed to protect spacecraft batteries from overcharging and overheating when the spacecraft goes into safe mode.

A new transmitter will replace a failed spare currently aboard the spacecraft, and a spare solid state recorder will be installed to allow efficient handling of high-volume data. Both missions will replace telescope insulation that has deteriorated. The insulation is necessary to control the internal temperature on the observatory.

The mission was announced in March. Though the time between announcement and launch is a relatively short nine months, Brown has no doubt that the STS-103 crew is prepared for its task.

"That is a little short from our normal template in the shuttle business, but I think it's the way we'll be going in the future so it's kind of nice to maybe break some ground here and try to make sure we can be the most efficient we can, between the beginning of training and launch date," Brown said. "So, that's the challenge, and I welcome



In the Vehicle Assembly Building, Ken Strite of NASA Quality Control inspects the connection between the Space Shuttle Discovery and the external tank that will be used to launch mission STS-103 in early December. This 10-day mission is designed to replace aging parts on the nine-year-old Hubble Space Telescope and to upgrade some of its functioning systems. During the flight, the astronaut crew will replace all six of the observatory's gyroscopes, a fine guidance sensor, its main computer, and other equipment.

the challenge and we've done quite well so far."

Hubble was launched aboard Discovery on April 24, 1990, and deployed during the STS-31 mission. The first servicing mission took place in December 1993, with the second servicing mission in February 1997. The last servicing mission is currently planned for 2003.

STS-103 is scheduled to conclude with a landing at Kennedy Space Center on Dec. 18. This will be the 96th Space Shuttle launch and the 27th flight for Discovery.

Foale, whose last flight included a docking with the

Russian space station Mir, looks forward to a different perspective this time.

At 317 nautical miles above Earth, Foale and his crewmates will have a lofty vantage point during the mission.

"I know that the Earth will look a bit more round; it'll look a bit more like the ball that the Apollo astronaut showed us that captivated me when I was a boy," Foale said. "So I want to go high, I want to see the Earth high, and I've always wanted to be on a Hubble flight because it goes high, it goes about as high as a shuttle can go."



# STS-103's crew ready to fly and then walk

STS-103, the Hubble Space Telescope Servicing Mission 3A, will require four space walks to replace and repair equipment on the troubled satellite.

Four days of extravehicular activity (EVA) tasks are scheduled, each requiring about six hours' work. Four EVA mission specialists will work in two-person teams on alternate days. To reduce crew fatigue, EVA crew members swap places once during each EVA day.

*EVA Day 1* – Mission Specialists Steven L. Smith and John M. Grunsfeld (Ph.D.). Preparation is needed before beginning the servicing tasks, such as installing the Manipulator Foot Restraint (MFR) on the RMS grapple fixture, installing the Low Gain Antenna Protective Cover, deploying the Translation Aids, and installing the Berthing and Positioning System Support Post on the Flight Support System. Also, attaching the Crew Aids and Tools (CATs) to the RMS handrails and the color television camera on the MFR.

**Tasks:** Change out three Rate Sensor Units in the telescope, part of the gyroscopes that keep Hubble stable or moving at a desired rate; remove caps and open the Near-Infrared Camera and Multi-Object Spectrometer (NICMOS)

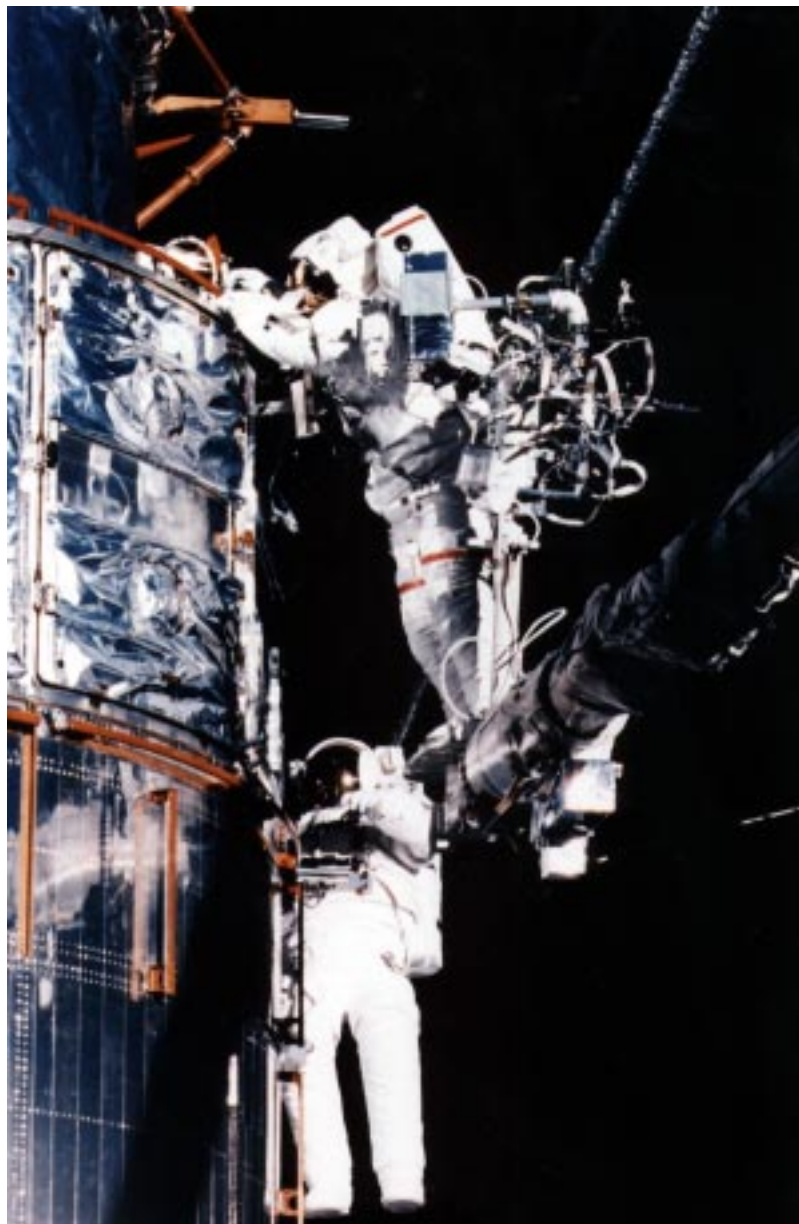
“Coolant In” and “Coolant Out” valves; install Voltage/temperature Improvement Kits (VIK) to protect Hubble's batteries from overcharging and overheating when in safe mode.

*EVA Day 2* – Mission Specialists C. Michael Foale (Ph.D.) and ESA Astronaut Claude Nicollier.

**Tasks:** Replace Hubble's DF-224 computer with a faster, more powerful unit called the Advanced Computer; install Bay 1 New Outer Blanket Layer (NOBL), stainless steel panels with a protective thermal Control Electronics Enhancement Kit connectors for the FGS-2; change out the S-band Single-Access Transmitter, which uses radio waves to send data to the ground; replace a mechanical tape recorder with a Solid State Recorder, which is faster and more reliable and has greater data storage capacity; repair the Multi-Layer Insulation (MLI) with NOBLs for Bays 5-10.

*EVA Day 3* – Smith and Grunsfeld.

**Tasks:** Mate additional Optical Control Electronics Enhancement Kit connectors for the FGS-2; change out the S-band Single-Access Transmitter, which uses radio waves to send data to the ground; replace a mechanical tape recorder with a Solid State Recorder, which is faster and more reliable and has greater data storage capacity; repair the Multi-Layer Insulation (MLI) with NOBLs for



Steven Smith, shown at bottom in this image from STS-82, is one of the astronauts who will perform an extravehicular activity during STS-103.

Bays 5-10.

*EVA Day 4* – Foale and Nicollier.

**Tasks:** Install new insulation material, Shell/Shield Repair Fabric (SSRF), on the outer surfaces of the telescope where MLI has become degraded;

install handrail covers on handrails in Bays A and J; install Aft Shroud Latch Repair Kits to fix door latches in the aft shroud area of the telescope that have been damaged by extreme temperature changes and high torques.

## Target dates prepare way for a busy 2000

Since early August, workers have painstakingly examined hundreds of miles of Shuttle electrical wiring in an effort to ensure that all four orbiters in the Shuttle fleet are safe to fly. Following Space Shuttle Columbia's main engine

controller failures during the STS-93 climb to orbit, NASA managers launched a fleet-wide investigation into Shuttle wiring health that postponed the entire launch manifest.

With quicker access to Discovery's midbody wiring

and with high priority on servicing the Hubble Space Telescope, managers decided in September to move mission STS-103 in front of STS-99. By October, wiring work and other processing challenges on orbiter Atlantis caused the STS-101

flight to move out to March.

Shuttle managers named Dec. 9 as the launch date for STS-103, with STS-99 set for Jan. 13. Atlantis' flight on mission STS-101 is targeted for March 16, with five missions scheduled to follow in 2000.

# Planners don't expect to be bugged by Y2K

With the year 2000 just over a month away, there are probably businesses and agencies across the country that would welcome additional time to prepare for potential problems. But Art Beller, Kennedy Space Center's Year 2000 Project Manager, would be perfectly happy if the milestone arrived sooner.

Beller says that KSC has prepared so thoroughly for the challenges associated with the date rollover that further testing is not needed.

"We're ready to go today," Beller said. "KSC has done as well as it has because Mr. (Roy) Bridges has made this a top priority and supported Y2K every step of the way, and Mr. (Daniel) Goldin, for his part, has made this a top priority for the Agency. I commend them for doing that. (The Y2K preparation) would have happened much less smoothly otherwise."

KSC's efforts to ensure a smooth transition into 2000

actually began in 1996. Following plans laid out by the Government Accounting Office (GAO), the Center began an "awareness" phase, alerting employees to the potential hazards of the century date change. That was followed by an "assessment" period that provided crucial information about the Center's needs and potential vulnerabilities.

Beller said KSC completed two inventories. The first inventory identified all mission-critical systems, and all non-mission critical systems with Y2K problems. The second inventory documented and certified all information technology and non-information technology items that are Y2K vulnerable.

The first inventory resulted in eight mission-critical systems and 140 non-mission critical systems. The second inventory resulted in more than 9,000 items.

## Preparations have included two inventories of all systems at KSC.

The Office of the Inspector General (OIG) joined the process in 1997, conducting concurrent audits as the KSC team performed its assessments and other phases.

"In my opinion, that's been wonderful," Beller said. "Even though there is always some tension with auditors, we had an excellent working relationship with our auditors. We were motivated to document thoroughly what was done as we went, whereas if (the OIG) hadn't been auditing us, we would have likely documented after the fact."

Under the guidance of Chief Information Officer Barbara Brown, KSC met a deadline of Y2K compliance by March 31, 1999, which included the implementation of any needed fixes and certification. In addition to making all necessary fixes, KSC has continued to test and has conducted drills. Beller said a recent Agency drill that tested the Center's abilities to communicate with Headquarters and other NASA centers proved successful.

Preparations also have included risk mitigation — such

as the creation of a plan for the placement of emergency generators. Though Beller anticipates no significant problems, KSC will have sufficient staff available should problems arise when the clock strikes midnight on Dec. 31.

Plans call for the Emergency Operations Center (EOC) to be staffed from noon on Dec. 31 until 5 p.m. on Jan. 1. The EOC will open again from 8 a.m. to 5 p.m. on Jan. 2. The EOC serves as a communications network during launches, landings, weather threats and such special events as presidential visits.

Wayne Kee, Emergency Preparedness Officer for NASA/KSC, said that each NASA center will have an emergency operations center staffed for the rollover, with all of those reporting to a NASA Headquarters center operated out of Goddard Space Flight Center. In addition, experts in each of the mission-critical systems will be on call until the full workforce returns on Jan. 3 and Jan. 4.

"We will be monitoring all the systems here on KSC to see if anything happens," Kee said. "Even though we've done a tremendous amount of Y2K preparation, we feel like this is a 1,000-year happening, so we're going to be here. We won't be toasting champagne; we'll be here working."

## Mars Lander nears journey's end

The first NASA launch of 1999 is nearing the climax of an 11-month mission.

The Mars Polar Lander continues on its course toward a Dec. 3 touchdown on the red planet. Polar Lander was processed at KSC and launched aboard a Delta 7425 from Cape Canaveral Air Station on Jan. 3.

The probe has since been cruising steadily toward Mars.

The targeted landing site is on the southern polar layered terrain, between 74S and 78S, less than 1,000 km from the South Pole.

This area underlies the seasonal advance and retreat of the South polar ice cap, and may contain clues to the climatic history of Mars. Landing occurs during Spring in the southern hemisphere of Mars.

## Bone marrow drive



Center Director Roy Bridges speaks at a ceremony on Nov. 10 to kick off KSC's marrow donor registration drive. John T. Cinco, M.D., of the Biomedical Office hosted the event, which included guest speaker Dr. Jill McGovern, CEO of The Marrow Foundation, and Rhonda Jackson, an American Red Cross Coordinator. KSC's donation campaign is scheduled for mid-February. During a two-day period, volunteers will have blood samples drawn so that their marrow types can be determined. Further details will be available as the drive draws nearer.



# “Spaceport” terms have different meanings

Spaceport Technology Center. Cape Canaveral Spaceport. Vision Spaceport.

These phrases have been seen and heard increasingly at Kennedy Space Center in recent months, but the overlapping terminology may cause some confusion. Some may wonder: What's the difference in these phrases? And has one or all three superceded Kennedy Space Center as the name for the place where we work?

The answer to the last question is no. Neither KSC nor Cape Canaveral Air Station (CCAS) has changed its official name. The new phrases are not intended to replace the historical names of the two entities but instead describe the future direction of the space launch centers.

So what do those words mean? Here is a brief summary:

**Spaceport Technology Center** — In a recent Center Director's Communication, Roy Bridges discussed the elements of the Spaceport Technology Center (STC) concept.

Above all, the phrase reflects a shift in the balance between KSC's operations and technology development efforts.

The specific definition of the STC is this: “A set of systems supporting the development and utilization of technologies required to access space.” As Bridges explained in his communication, the STC

concept emphasizes a “system of systems” approach, in which KSC pursues its core business of providing space systems, processes, tests and launch techniques and developing the associated technologies.

The purpose of STC is to align the Center's technology development efforts with its roadmap and strategic implementation plan. STC, both a concept and a structured technology framework, is supported by many different ideas, teams, projects and facilities.

Loren Shriver, deputy director for Launch and Payload Processing, serves as the manager of STC coordination. A full description of the STC concept can be found on the Center's internal Web site under the heading “Major Projects/KSC's Future.”

**Cape Canaveral Spaceport** — Shriver explains that this name refers to “a concept that promotes viewing our area as an easy place to do space launch business.” The term, based on the geographical location of both CCAS and KSC, grew from efforts to establish more of a joint approach in how business is performed at the centers. The concept promotes the development of true “one stop shopping” for new Eastern Range customers.

The Cape Canaveral Spaceport Steering Team consists of senior managers from both

NASA/KSC and the 45th Space Wing.

**Vision Spaceport** — This name refers to a specific project, a Joint Sponsored Research Agreement that KSC entered in 1998 along with Ames Research Center and representatives from industry and academia. All parties contribute to the project and work toward achieving the objectives of the agreement through the project partnership. This project is supported at KSC by the Spaceport Synergy Team.

Specifically, the project is dedicated to promoting a research and development partnership among government, industry and academia to help conceive revolutionary new spaceport architectures and space launch operations capabilities.

This “R&D” partnership aims to promote the development of commercially valuable conceptual design and detailed design tools, models and sub-scale demonstrations of derived concepts, for the purpose of advancing the state of the art in spaceport performance.

The partnership has a goal of producing new technology and concepts that lead to greatly enhanced flight rates at costs much lower than those available with today's capabilities. Vision Spaceport is one of many technology development projects supporting KSC's evolution to a Spaceport Technology Center.

## Promotion gives Wetmore SES position

Michael Wetmore has been named Deputy Director of the Shuttle Processing directorate, effective Nov. 21. This is a Senior Executive Service position.

Prior to the appointment, Wetmore was detailed for one year to NASA Headquarters as chief of the Space Shuttle Resources and Program Evaluation Branch. In that position, he brought communications with the Agency Comptroller's Office and field organizations to unprecedented levels of effectiveness and successfully represented major space flight program plans and requirements at the highest levels of governmental review.

In 1987, following service as a commissioned officer with the United States Navy, Wetmore joined NASA at Kennedy Space Center. He advanced to a position as a lead Shuttle systems engineer.

In 1991, Wetmore was selected as Requirements Management Lead in the Shuttle Project Management Office. He received the NASA Exceptional Service Medal for his leadership in creating new approaches to Shuttle Program budget planning and for leading the development, justification and implementation of a budget plan saving NASA in excess of \$1 billion over a seven-year period.

As manager of the Shuttle

Process Management Office at KSC from 1996 to 1998, Wetmore played a key role in the successful transition of Shuttle processing functions to the Agency's single prime Space Flight Operations Contractor and the transition of the Shuttle Processing organization from direct supervision to its new role in contractor surveillance and evaluation.

Beginning in 1997, Wetmore took on additional duties as Deputy Director of Shuttle Integration. Challenged with the necessity of downsizing and consolidation in Shuttle Processing, he assisted the director in developing and leading implementation of a re-organi-



Michael Wetmore

zation plan combining responsibilities in integrated test operations, management of Shuttle Program funded development projects and integrated launch and landing activities into one new Process Integration organization.



**Stationary object arrives**

Workers adjust the connection of the port-side P3 truss on its workstand in the Operations and Checkout Building on Nov. 17. The truss, a segment of the International Space Station (ISS), is scheduled to be launched on mission STS-115 in 2002 aboard the Space Shuttle Atlantis.

# KSC gears up for Terra

When the Terra Spacecraft launches next month from Vandenberg Air Force Base in California, a rumble will be felt at Kennedy Space Center. The launch, scheduled for mid-December, puts KSC in the role of launch site support management, a function of KSC's designation as lead center for Expendable Launch Vehicles.



Television Infrared Observation Satellite (TIROS-1). New satellite and computer technologies now make it possible to study the Earth as a global system. Terra is part of the Earth Observing System, which will gather data needed to help scientists understand the complex links among air, land, water and life within the Earth system.

KSC will conduct launch operations under a contract with Lockheed Martin Astronautics.

Originally called EOS AM-1, Terra serves as the flagship in a series of EOS spacecraft. It carries five state-of-the-art instrument sets with measurement and accuracy capabilities never flown before.

Terra represents the next generation of atmospheric satellites, following the tradition begun in the 1960s by NASA's

## Awards ...

*(Continued from Page 1)*

tional Scientific and Technical Contributors.

KSC as a whole captured \$140,000 in Space Act Awards for the 1999 fiscal year, finishing ahead of the Jet Propulsion Laboratory, which had ranked first for the previous 16 years. Overall, KSC placed fourth among NASA centers, with Goddard Space Flight Center leading the way.

The total represented an increase from the previous high of \$97,000 in awards KSC received for the 1998 fiscal year. In addition, KSC led all centers with 65 software releases, a new Agency record.

"KSC has been knocking itself out to reshape itself as an R&D powerhouse, and it's starting to get that recognition," Curto said. "(Center Director Roy Bridges) has been talking about wanting to do that for some time, so there you go — it's working. This is good, solid evidence of that progress."

The Space Act Awards

program was set up during NASA's formation in 1958 as a way of encouraging technological innovation among employees. Awards are automatically given to workers who are published in the magazine *Tech Briefs*, submit an application for a patent or have software officially released by NASA.

In addition, the Invention and Contributions Board offers board action awards of up to \$100,000, the third-largest scientific prizes available in the world. Those awards are determined by a process of peer review, with Curto presenting the case for each employee.

KSC surpassed its previous high by receiving 19 board action awards, which yielded \$81,400 in prizes for employees. Curto noted that NASA Administrator Daniel Goldin receives summaries of all awards of \$1,000 or more.

"This recognition from Headquarters is fantastic news for KSC," Bridges said. "These awards show that we have made substantial progress in increasing technological development

at the Center. I congratulate the award winners for their innovative ideas and dedication."

Curto said KSC's number of software releases was particularly impressive.


"That's absolutely stunning," Curto said. "There's a lot of good stuff going on here."

The technology for which Helms earned recognition is actually 20 years old. The system, in use since the first Shuttle launch, detects leakage during propellant loading in

several crucial areas around the orbiter. Helms said that the system on three occasions has found leaks that halted potentially dangerous launches.

"It's nice to know something you designed and developed has saved people's lives ... at least once and possibly several times," Helms said.

Helms already has plans for the \$10,000 check from NASA. An amateur astronomer, he plans to use the money to buy a telescope.



John F. Kennedy Space Center

## Spaceport News

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